ORIGINAL ARTICLE

Psychometric Evaluation of the Indonesian Version of the COM-B Model: Assessing Behavioral Determinants of Treatment Adherence in Hemodialysis Patients

Yeni Yulianti[1,2], Devi Nallapan[1], Teten Tresnawan[2]

[1] School of Nursing&Applied Science, Lincoln University College, Wisma Lincoln, No. 12-18, Jalan SS 6/12, 47301 Petaling Jaya, Selangor Darul Ehsan, Malaysia.
[2] Sekolah Tinggi Ilmu Kesehatan Sukabumi, Jalan Karamat no 36 Kota Sukabumi, 43111, West Java Province, Indonesia

ABSTRACT

Introduction: Adherence to complex treatment regimens is crucial for individuals undergoing hemodialysis (HD) to improve clinical outcomes and quality of life. The COM-B model is widely used to examine behavioral influences in health settings, but its reliability and validity have not been assessed in HD patients in Indonesia. Objective: This study aimed to adapt the COM-B Behavior Model questionnaire for Indonesian maintenance hemodialysis patients and evaluate its psychometric properties. **Methods:** A cross-sectional design included 250 adult HD patients from four centers in West Java, Jakarta, and Banten. The instrument was translated, reviewed by experts, and pretested before validation. Content validity was assessed using I-CVI, S-CVI/Ave, and CVR. Concept validity was evaluated with exploratory and confirmatory factor analyses. Cronbach's alpha was used to assess internal consistency, and ICCs to evaluate test-retest reliability. Convergent validity was assessed through correlations with MMAS-8, and discriminant validity tested with KDQOL-SF v1.3. **Results:** The final 21-item version showed strong content validity (I-CVI = 0.83–1.00; S-CVI/Ave = 0.89; CVR ≥ 0.62). A five-factor structure from EFA explained 71.29% of the variance, and CFA confirmed good model fit (χ^2/df = 1.98, CFI = 0.93, RMSEA = 0.055). Cronbach's alpha ranged from 0.71 to 0.91, and ICCs from 0.76 to 0.89. **Conclusion:** The adapted Indonesian COM-B questionnaire is a valid, reliable tool for assessing behavioral factors linked to treatment adherence in HD patients.
Malaysian Journal of Medicine and Health Sciences (2026) 22(SUPP9):87-94. doi:10.47836/mjmhs.22.s9.14

Keywords: Adherence, Behavior, COM-B Model, Hemodialysis, Indonesia

Corresponding Author:
Devi Nallapan, PhD
Email: devinallappan@lincoln.edu.my
Tel: +60 14 366 1992

INTRODUCTION

Adherence to prescribed regimens in chronic conditions often determines the success of treatments and significantly impacts patients' quality of life (1). Attendance during dialysis sessions, compliance with food and hydration restrictions, and regular drug consumption are all aspects of haemodialysis (HD) treatment that patients with end-stage renal disease (ESRD) must adhere to. Fluid overload, hyperkalaemia, and cardiovascular events are among the problems that can arise from non-adherence in this group, leading to an increase in morbidity, hospitalisation, and death (2). Therefore, the identification and understanding of behavioral determinants influencing adherence are essential for improving clinical outcomes in this high-risk group.

Research on adherence behaviors in hemodialysis (HD) patients has utilized various models to explain and address factors influencing adherence. The Health Belief Model (HBM) is a popular framework that focusses on people's perceptions of their own susceptibility, the seriousness of the problem, the benefits of taking action, and the barriers that hinder them from doing so. While the HBM has been instrumental in understanding health behaviors, it does not explicitly integrate environmental or social influences, limiting its utility in contexts where these factors play a significant role (3). In a similar vein, TPB states that one's attitude, subjective norms, and perceived behavioural control are the most important factors in determining one's intention and future behaviour (4). Although effective in capturing intentional behavior, TPB assumes a linear pathway from intention to behavior, which may not fully capture the complexities of adherence among HD patients, particularly in resource-limited settings. More recent models, such as the Transtheoretical Model (TTM), offer a staged approach to behavior change, recognizing that individuals move through different stages of readiness

(5). While TTM has been applied successfully in some health behavior interventions, its application in HD adherence is challenged by its lack of integration of contextual and capability-related factors, which are crucial in understanding adherence among diverse populations. Social Cognitive Theory (SCT) incorporates self-efficacy, observational learning, and environmental factors but does not provide a structured framework for identifying specific intervention targets (6–8).

An all-encompassing model that stands out is the capacity, opportunity, and motivation (COM-B) model that was established by (9), There are three main parts to this theory, and they are as follows: capability (C), opportunity (O), and motive (M) (9). This model is uniquely suited to address adherence in HD patients because it explicitly integrates individual, social, and environmental determinants of behavior (10). Capability includes both physical and psychological capacities to engage in adherence behaviors, such as understanding treatment regimens. Opportunity encompasses external factors, such as social support and healthcare system accessibility, which influence the ability to adhere. Motivation includes reflective and automatic processes driving adherence decisions, allowing the model to capture both conscious planning and habitual behaviors (9). The COM-B model is particularly suitable for analyzing complex, multidimensional behaviors such as treatment adherence among HD patients, as it accounts for both internal and external determinants and is adaptable for intervention development (10,11).

Among hemodialysis (HD) patients, the complexity of adherence behavior underscores the need for a model that addresses multiple dimensions influencing behavior. For instance, physical capability, such as the ability to prepare renal-friendly meals, and psychological capability, such as understanding dietary restrictions, are critical for dietary adherence (12,13). Social opportunities, such as support from family members, and environmental opportunities, such as access to low-sodium foods, also play a role in adherence (14,15). Motivation, which includes patients' beliefs about the benefits of adherence and emotional responses to their health condition, further influences their behaviors (16). Because of its flexibility and comprehensive character, the COM-B model is well-suited to our investigation. (17,18), found that the COM-B model is more suited to tackling complicated behaviours like adherence in HD patients because it integrates a wider spectrum of impacts, as opposed to models that may focus just on specific components. By taking these factors into account, the COM-B model allows for the creation of treatments that are suitable for different contexts and provide a strong foundation for understanding adherence behaviours.

While the psychometric validity of the COM-B model has been established in various populations, including those with diabetes, cardiovascular disease, and cancer in Western contexts (19,20), limited validation studies exist in Southeast Asian populations. In countries such as Malaysia and Thailand, culturally adapted models have shown promise in assessing adherence-related behaviors, but few have applied COM-B specifically to the ESRD population (21). In the Indonesian context, cultural dynamics such as collectivism, strong family involvement in decision-making, religious coping, and healthcare accessibility disparities may significantly influence adherence behaviors but remain underexplored in behavioral model validation studies (22–24).

To date, no study has systematically evaluated the COM-B model's applicability and measurement validity among Indonesian HD patients. This presents a critical gap, especially given Indonesia's high ESRD burden, sociolinguistic diversity, and decentralised health infrastructure. Moreover, tool validation in this setting is crucial for ensuring cultural appropriateness, linguistic clarity, and contextual sensitivity, which are key to accurately measuring adherence and designing effective interventions.

This study aims to fill this gap by translating and validating the Indonesian version of the COM-B model among patients undergoing hemodialysis. It represents the first psychometric assessment of this model in the Indonesian context and among ESRD populations in Southeast Asia. The findings are expected to contribute to the development of culturally relevant behavioral assessment tools, inform policy and practice in chronic disease management, and strengthen the regional evidence base on adherence in renal care.

MATERIALS AND METHODS

Study Design

This cross-sectional study of haemodialysis patients aimed to investigate the psychometric properties of the COM-B Model of Behaviour questionnaire, more especially its Indonesian version. The research includes tests for internal consistency, content validity, and face validity.

Sample

Participants were recruited between January and April 2025 from four diverse hemodialysis centers located in urban and semi-urban regions across West Java, Jakarta, and Banten, Indonesia. This multi-site approach was chosen to enhance the generalizability of findings across varied geographic, socioeconomic, and healthcare delivery contexts in Indonesia. People who were able to participate had to be at least 18 years old, have been on maintenance haemodialysis for three months, be fluent in Bahasa Indonesia, and be prepared to provide their informed permission. In order to ensure that all patients were able to adequately complete the

self-report questionnaires, we eliminated those with any cognitive impairments or active psychiatric diagnoses.

Prescribed psychometric criteria were used to obtain the sample size. In order to do component analysis and structural modelling using the 21-item COM-B questionnaire, a minimum of 210 participants were needed, with an item-to-response ratio of 10:1 (25). To ensure sufficient power for confirmatory factor analysis (CFA) and subgroup invariance testing, a final sample of 250 participants was achieved through consecutive sampling, wherein all eligible patients attending dialysis sessions during the recruitment period were invited to participate.

Instrument

Using the Theoretical Domains Framework (TDF), the questionnaire was created with the COM-B model's behavioural determinants in consideration. The tool, developed by Moffat et al. (2020), consists of 21 items categorized into three components: 1) Capability Component (12 items) with domains include knowledge, self-efficacy, attitude, perceived barriers, and perceived risk. Sample item: "I have enough information about taking my medications regularly and on time." Internal consistency using Cronbach's alpha = 0.70. 2) Opportunity Component (4 items) with domain social support. Sample item: "I believe that the emotional support of my friends regarding the use of my medication encourages me to have better management in the regular use of my medication." Internal consistency using Cronbach's alpha = 0.78. 3) One of the five components of motivation is the following: "I avoid a life of agony and misery by taking my medications as prescribed and on time." Our reliability coefficient is 0.78 according to Cronbach's alpha. For this purpose, we rated each topic using a 5-point Likert scale, where 1 indicates very disagreeing and 5 indicates very agreeing. To achieve this goal, we used a 5-point Likert scale, where 1 signifies strongly opposing and 5 signifies strongly agreeing, to score each issue. The higher the score, the more in agreement there is about the elements that promote treatment adherence. Primary research indicated Cronbach's alpha values between 0.70 and 0.78.

Translation and Content Validation

In order to adjust the instrument according to WHO requirements, the original English version was translated into Bahasa Indonesia. The forward translation was done by two separate translators, and then two more translators, who were not given access to the source, did the back translation. A group of professionals from several fields, including nephrologists, psychology, nursing education, and health promotion, met to address any disagreements. The twelve experts in the field used a 4-point scale to rate the clarity and relevance of each topic. According to (26) A threshold of 0.78 or higher for the Item-Level Content Validity Index (I-CVI) may be considered acceptable, whereas a value of 0.90 or higher was required for the Scale-Level Content Validity Index (S-CVI/Ave). Our Content Validity Ratio (CVR) for each item was determined using Lawshe's technique and a cutoff of 0.62 (for 12 experts).

Construct Validity and Factor Structure

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to assess the structural validity of the Indonesian version of the instrument. Initially, an oblique rotation EFA with main axis factoring was executed to uncover the instrument's latent factor structure. Before factor extraction, the dataset was examined for its suitability for factor analysis using Bartlett's tests of sphericity and Kaiser-Meyer-Olkin (KMO). The fact that the correlation matrix was not an identity matrix was confirmed by a statistically significant result ($p < 0.001$) from Bartlett's test. Factor analysis was supported by a KMO value higher than 0.80, which indicated appropriate sampling.

After EFA, the hypothesised factor model from the exploratory phase was tested for goodness-of-fit using CFA, which was carried out using AMOS version 26. Two of the model fit indices used to evaluate the component structure's sufficiency, the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), both have cutoff values of 0.90 or above. This is considered sufficient. Furthermore, the Standardised Root Mean Square Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA) served as indicators of model parsimony and residual error, respectively. If the value is less than or equal to 0.08, then it is a good match. The structural validity of the updated instrument was substantiated by this two-pronged approach.

Reliability

Total and subscale scores were used to evaluate internal consistency reliability using Cronbach's alpha, with $\alpha > 0.70$ being deemed satisfactory. An intraclass correlation coefficient (ICC) of 0.75 or above indicates strong stability, and it was used to evaluate test-retest reliability in a subgroup of 30 patients who re-completed the questionnaire two weeks later.

Hypothesis Testing and Known-Groups Validity

In order to further investigate construct validity, we used one-way ANOVA and independent t-tests to evaluate hypotheses about differences in total scores among known groups (e.g., job status, dialysis duration, age group). Results of statistically significant ANOVA were further examined using post hoc comparisons (Bonferroni).

Convergent and Discriminant Validity

We hypothesised that the COM-B subscales and MMAS-8 scores would have moderate to high positive correlations ($r > 0.50$) in order to detect convergent validity. The COM-B scores were correlated with

unrelated KDQOL-SF v1.3 dimensions (such as Emotional Well-being and Physical Functioning) in order to examine discriminant validity. We expected weak or non-significant correlations ($r < 0.30$).

Measurement Invariance

Using configural, metric, and scalar invariance, multi-group CFA was performed to assess the factor structure's generalisability across subgroups (such as gender and job position).

Data Collection and Ethical Approval

Participants were approached during routine dialysis sessions and screened for eligibility by trained research assistants. Eligible individuals who agreed to participate were invited to a private area within the dialysis unit to complete the self-administered questionnaire in paper format. For participants with limited literacy or visual difficulties, research assistants provided standardized verbal assistance without influencing responses. To ensure consistency across sites, all research assistants underwent centralized training in data collection procedures, including informed consent, administration protocols, clarification techniques, and ethical handling of sensitive information. Completed questionnaires were checked immediately for completeness and securely stored.

This study has the necessary ethical clearances from STIKes Sukabumi's Institutional Review Board (Ref: 032/ETIK/2024). Before enrolling each participant, we made sure to get their written informed permission. The study followed all national standards in Indonesia for research involving human participants and was ethically conducted in accordance with the Declaration of Helsinki.

Data Analysis

We used SPSS 26 and AMOS 26 to analyse the data. For demographic factors, descriptive statistics were employed. With a significance level of $p < 0.05$, reliability indices (ICC and Cronbach's alpha), external factor analysis (EFA), correlation analysis (CFA), and other research were carried out. Prior to parametric testing, we evaluated the assumptions of normality and used various imputation approaches to manage missing data.

RESULTS

Table I presents the demographic and clinical characteristics of the 250 hemodialysis patients included in this study. Most participants were male (n = 151, 60.4%) and aged 41–60 years (n = 135, 54.0%). The largest proportion had undergone hemodialysis for 3–5 years (n = 109, 43.6%), followed by more than 5 years (n = 56, 22.4%), 1–2 years (n = 50, 20.0%), and less than 1 year (n = 35, 14.0%). Most participants were unemployed (n = 187, 74.8%).

Table 1. Demographic and Clinical Characteristics of Participants (n = 250)

Variable	n	%
Gender		
Male	151	60.4
Female	99	39.6
Age (years)		
≤40	45	18.0
41–60	135	54.0
>60	70	28.0
Duration of hemodialysis		
<1 year	35	14.0
1–2 years	50	20.0
3–5 years	109	43.6
>5 years	56	22.4
Employment status		
Employed	63	25.2
Unemployed	187	74.8

Content Validity

The 21-item Indonesian COM-B questionnaire, which measures Capability, Opportunity, and Motivation, was tested for content validity using item-level content validity index (I-CVI) and content validity ratio (CVR). Based on the data, it appears that experts were in agreement that these items were relevant and needed, since most of the items had I-CVI values ranging from 0.83 to 1.00 and CVR values exceeding the least acceptable threshold of 0.62. The Capability component's strong I-CVI ratings for knowledge, self-efficacy, perceived obstacles, and risk perception indicate that these items are culturally and contextually appropriate for haemodialysis patients in Indonesia. Similarly, with CVR scores ranging from 0.75 to 1.00, all items in the Opportunity and Motivation components had outstanding content validity. The scale-level content validity index (S-CVI/Ave) was calculated at 0.89, which exceeds the commonly accepted benchmark of 0.80 for excellent content validity (Table II).

Exploratory Factor Analysis (EFA) and reliability

Exploratory factor analysis and reliability findings are presented in Table III. The factor loading ranges were

Table II. Content Validity of the Indonesian COM-B Questionnaire

Component	Domain(s)	No. of items	I-CVI range	CVR range
Capability	Knowledge, self-efficacy, attitude, perceived barriers, perceived risk	12	0.80–0.99	0.62–0.91
Opportunity	Social support	4	0.84–0.97	0.72–0.99
Motivation	Motivation	5	0.86–0.92	0.64–0.87
Overall scale	All domains	21	S-CVI/Ave = 0.89	—

Note. I-CVI = item-level content validity index; CVR = content validity ratio; S-CVI/Ave = scale-level content validity index, average method. Values were summarized from the 21 item-level ratings.

Table III. Exploratory Factor Analysis and Reliability of the Indonesian COM-B Questionnaire

Component	Domain/subcomponent	Item numbers	Factor loading range	Cronbach's alpha (α)	ICC (2-week interval)
Capability	Knowledge	1–3	0.76–0.81	0.76	0.80
Capability	Self-efficacy	4–6	0.77–0.83	0.82	0.83
Capability	Attitude	7–8	0.75–0.78	0.74	0.78
Capability	Perceived barriers	9–10	0.69–0.71	0.71	0.76
Capability	Perceived risk	11–12	0.73–0.74	0.73	0.77
Opportunity	Social support	13–16	0.84–0.89	0.84	0.85
Motivation	Motivation	17–21	0.86–0.91	0.87	0.88
Total scale	All components	1–21	—	0.91	0.89

Note. EFA = exploratory factor analysis; ICC = intraclass correlation coefficient. The five-factor solution explained 71.29% of the total variance. α ≥ 0.70 indicates acceptable internal consistency; ICC ≥ 0.75 indicates good test-retest reliability.

acceptable across all domains, including knowledge, self-efficacy, attitude, perceived barriers, perceived risk, social support, and motivation. The five-factor solution explained 71.29% of the total variance. Internal consistency was satisfactory for all domains, with Cronbach's alpha values ranging from 0.71 to 0.87, while the total scale showed excellent internal consistency (α = 0.91). Test-retest reliability over a two-week interval was also good, with ICC values ranging from 0.76 to 0.88 for the subscales and 0.89 for the total score.

Confirmatory Factor Analysis (CFA) and measurement invariance

The CFA model fit indices and measurement invariance results are shown in Table IV. The CFA demonstrated acceptable model fit, with $\chi^2/df = 1.98$, CFI = 0.93, TLI = 0.91, RMSEA = 0.055, and SRMR = 0.045. The CFA model is illustrated in Figure 1, showing the relationships between the COM-B components and their observed domains. Measurement invariance was supported across gender and employment status at the configural, metric, and scalar levels, as all ΔCFI values were ≤ 0.01. These findings indicate that the Indonesian COM-B questionnaire measured the same constructs consistently across the tested subgroups.

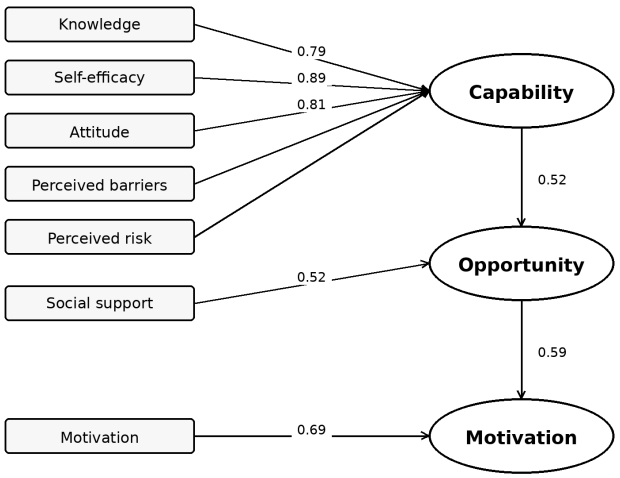

Figure I: CFA model of the Indonesian COM-B questionnaire

Table IV. Confirmatory Factor Analysis Model Fit and Measurement Invariance
Section A. Overall CFA model fit

Fit index	Value	Recommended threshold	Interpretation
χ^2	354.27	—	Reported chi-square value
df	179	—	Degrees of freedom
χ^2/df	1.98	< 3.00	Acceptable model fit
CFI	0.93	≥ 0.90	Good fit
TLI	0.91	≥ 0.90	Acceptable fit
RMSEA	0.055	≤ 0.08	Good fit
SRMR	0.045	≤ 0.08	Good fit

Section B. Measurement invariance across gender and employment status

Group	Invariance level	χ^2 (df)	$\Delta\chi^2$ (Δdf)	CFI	ΔCFI	RMSEA	Invariance supported
Gender	Configural	812.34 (428)	—	0.926	—	0.053	Yes
Gender	Metric	831.21 (442)	18.87 (14)	0.922	0.004	0.054	Yes
Gender	Scalar	857.40 (456)	26.19 (14)	0.918	0.004	0.056	Yes
Employment status	Configural	796.12 (428)	—	0.928	—	0.052	Yes
Employment status	Metric	819.45 (442)	23.33 (14)	0.923	0.005	0.053	Yes
Employment status	Scalar	846.67 (456)	27.22 (14)	0.919	0.004	0.054	Yes

Note. CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual. RMSEA and SRMR are presented as decimal values. ΔCFI ≤ 0.01 supports measurement invariance.

Known-groups, convergent, and discriminant validity
Evidence for known-groups, convergent, and discriminant validity is summarized in Table V. Known-groups validity was supported by significant differences in COM-B total scores according to employment status, dialysis duration, and age group. Employed participants had significantly higher scores than unemployed participants ($t(248) = 3.89$, $p < 0.001$). Significant differences were also observed across dialysis duration groups ($F(2,247) = 6.72$, $p = 0.002$) and age groups ($F(2,247) = 4.15$, $p = 0.017$). Convergent validity was supported by moderate to strong positive correlations between the COM-B subscales and MMAS-8 scores ($r = 0.51–0.70$, $p < 0.001$). Discriminant validity was supported by weak correlations between COM-B scores and the unrelated KDQOL-SF domains of emotional well-being and physical functioning ($r = 0.16–0.28$).

DISCUSSION

This study aimed to validate the Indonesian version of the COM-B Model of Behavior questionnaire among patients undergoing maintenance hemodialysis. The findings demonstrate that the instrument possesses strong psychometric properties, confirming its suitability for measuring behavioral determinants of treatment adherence in this population.

High levels of agreement among expert reviewers were demonstrated by the findings of the content validity assessment. With Content Validity Ratio (CVR) values above 0.62 and Item-Level Content Validity Index (I-CVI) values over 0.83, the majority of items met the criteria for validity. These results show that there is a lot of agreement on the items on the instrument being relevant and acceptable for haemodialysis patients in Indonesia in terms of culture. Items in the Capability domain, such as knowledge, self-efficacy, perceived barriers, and risk perception, scored exceptionally well, indicating that these concepts are relevant to Indonesian healthcare and society beyond just being valid in theory. Further evidence of the translated version's suitability is the overall Scale-Level Content Validity Index (S-CVI/Ave) of 0.89.

Exploratory Factor Analysis (EFA) was used to evaluate the concept validity. A five-factor structure was established, accounting for almost 71% of the total variance. The conceptual components and underlying domains of the COM-B model were well-aligned with these elements. There is a strong item-construct correlation when the factor loadings score is between 0.512 and 0.842. Confirmatory Factor Analysis (CFA) goodness-of-fit indices all went above and above what was required, lending credence to this structure. The instrument's structural validity was confirmed by the results of the CFI (0.93), TLI (0.91), RMSEA (0.055), and SRMR (0.045), which showed that the proposed model nicely matched the data. These results are in line with earlier studies that validated the COM-B model in a variety of domains, including health behaviour (9,19).

Reliability analyses also supported the internal consistency and temporal stability of the instrument. Cronbach's alpha values across all subscales exceeded 0.70, with the total scale achieving an excellent value of 0.91. The self-efficacy and motivation components displayed particularly high reliability ($\alpha = 0.82$ and $\alpha = 0.87$, respectively), underscoring their importance in adherence behavior. The test-retest analysis yielded Intraclass Correlation Coefficients (ICCs) between 0.76 and 0.89, indicating good to excellent temporal stability. These results suggest that the instrument can reliably measure behavioral constructs over time, which

Table 5. Known-Groups, Convergent, and Discriminant Validity of the Indonesian COM-B Questionnaire
Section A. Known-groups validity

Variable	Group comparison	Mean (SD)	Test statistic	p-value	Post-hoc finding
Employment status	Employed vs unemployed	72.3 (8.4) vs 68.1 (9.2)	$t(248) = 3.89$	< 0.001	—
Dialysis duration	<1 year; 1–3 years; >3 years	66.5 (9.6); 70.7 (8.2); 72.8 (7.9)	$F(2,247) = 6.72$	0.002	<1 year lower than 1–3 years and >3 years
Age group	18–39 years; 40–59 years; ≥60 years	69.0 (9.3); 68.4 (8.8); 72.1 (7.5)	$F(2,247) = 4.15$	0.017	≥60 years higher than 40–59 years

Section B. Convergent and discriminant validity

COM-B subscale	MMAS-8 (convergent validity)	KDQOL-SF: Emotional well-being	KDQOL-SF: Physical functioning
Knowledge	0.62***	0.21	0.18
Self-efficacy	0.65***	0.25	0.20
Attitude	0.58***	0.19	0.17
Perceived barriers	0.51***	0.23	0.16
Perceived risk	0.53***	0.22	0.19
Social support	0.59***	0.28	0.24
Motivation	0.67***	0.27	0.21
Total COM-B score	0.70***	0.26	0.23

Note. MMAS-8 = Morisky Medication Adherence Scale-8; KDQOL-SF = Kidney Disease Quality of Life Short Form v1.3. $r \geq 0.50$ supports convergent validity; $r < 0.30$ supports discriminant validity. ***$p < 0.001$. The group sizes and dialysis-duration categories used for known-groups testing should be verified against the raw data because the original demographic and known-groups tables used inconsistent categories/sample sizes.

is essential for both clinical assessment and longitudinal research.

Known-groups validity was confirmed by significant differences in COM-B total scores across employment status, dialysis duration, and age groups. Employed participants reported significantly higher adherence-related behaviors compared to those unemployed, which may reflect structured daily routines, health motivation, or greater self-efficacy. Additionally, patients with longer durations of dialysis showed higher adherence scores, possibly due to increased familiarity with treatment regimens or cumulative exposure to education and support. Age was also a differentiating factor, with older patients exhibiting better adherence. These patterns are consistent with previous literature indicating that social and clinical factors significantly influence adherence behaviors (15,16).

Convergent validity was demonstrated through moderate to strong positive correlations between the COM-B subscales and MMAS-8 scores ($r = 0.51–0.70$, $p < 0.001$), confirming that the instrument effectively captures adherence-related behavioral determinants. In contrast, discriminant validity was established through weak correlations ($r < 0.30$) with unrelated KDQOL-SF domains, such as emotional well-being and physical functioning, supporting the instrument's specificity in measuring behavioral constructs rather than general health status.

Measurement invariance analysis showed that the factor structure of the COM-B model was stable across gender and employment subgroups. Configural, metric, and scalar invariance were all supported, indicating that the instrument functions equivalently across demographic groups. This finding strengthens the instrument's applicability for comparative studies and ensures its fairness in diverse clinical populations.

Overall, these findings provide robust empirical support for the validity and reliability of the Indonesian version of the COM-B questionnaire in hemodialysis settings. The instrument captures essential dimensions of treatment adherence behaviors in a culturally appropriate manner, which is critical for the development of targeted behavioral interventions. Moreover, its demonstrated measurement invariance enhances its utility for future research and clinical monitoring across diverse patient populations.

This study was conducted in selected urban and semi-urban centers, potentially limiting generalizability to rural or remote settings with different cultural or healthcare dynamics. Additionally, reliance on self-report instruments may introduce biases such as social desirability bias, where participants respond in ways they consider socially acceptable, and recall bias, resulting from inaccurate recollections of past behaviors or experiences. To minimize these biases, several strategies were implemented. Participants were assured of confidentiality and anonymity to reduce socially desirable responses. The questionnaire was self-administered in a private setting without the presence of healthcare providers or family members to prevent response pressure. Items were neutrally worded to avoid leading responses, and research assistants were trained to provide standardized clarifications without influencing participants' answers. Furthermore, data triangulation—comparing results with clinical records (e.g., dialysis schedules and attendance logs)—was used to validate self-report accuracy and mitigate recall limitations. Future studies are recommended to incorporate longitudinal or mixed-method designs, such as in-depth interviews and behavioral observations, to further limit these potential sources of bias.

CONCLUSION

Results from this study provide credence to claims that the COM-B Model of Behaviour questionnaire, as translated into Indonesian, is a valid and reliable tool for measuring treatment adherence behaviours in haemodialysis patients. The test has satisfactory test-retest reliability, strong internal consistency, and strong factor structure in addition to great content validity. Furthermore, construct validity was supported through known-groups comparisons, and the tool's convergent and discriminant validity were confirmed through correlations with established adherence and quality-of-life measures. Measurement invariance across gender and employment status indicates that the instrument functions consistently across diverse subgroups, enhancing its utility for both clinical and research applications. The validated COM-B instrument offers valuable implications for healthcare providers and researchers. Clinically, it can serve as a diagnostic tool to identify behavioral determinants that may hinder adherence, guiding the development of personalized interventions to improve patient outcomes. Its use can also facilitate routine behavioral assessments in dialysis centers, enabling early identification of non-adherence risk. For researchers, the tool provides a culturally appropriate and theoretically grounded measure for studying adherence behaviors in Indonesia and similar low- and middle-income country contexts. Future research should explore the instrument's predictive validity over time and its responsiveness to behavioral interventions. Adaptation and validation in other chronic disease populations may further extend its utility. By incorporating this tool into behavioral health strategies, healthcare systems may enhance adherence monitoring and design targeted, evidence-based interventions to improve long-term outcomes in patients with end-stage renal disease.

REFERENCES

1. Maruyama Y, Kanda E, Kikuchi K, Abe M, Masakane I, Yokoo T, et al. Association between anemia and mortality in hemodialysis patients is modified by the presence of diabetes. J Nephrol. 2021;34(3):781-790. doi:10.1007/s40620-020-00809-y
2. Patil VP, Salunke BG. Fluid overload and acute kidney injury. Indian J Crit Care Med. 2020;24 Suppl 3:S94-S97. doi:10.5005/jp-journals-10071-23606
3. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the Health Belief Model. Health Educ Q. 1988;15(2):175-183. doi:10.1177/109019818801500203
4. Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process. 1991;50(2):179-211. doi:10.1016/0749-5978(91)90020-T
5. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. Am J Health Promot. 1997;12(1):38-48. doi:10.4278/0890-1171-12.1.38
6. Bandura A. Health promotion by social cognitive means. Health Educ Behav. 2004;31(2):143-164. doi:10.1177/1090198104263660
7. Schunk DH, DiBenedetto MK. Motivation and social cognitive theory. Contemp Educ Psychol. 2020;60:101832. doi:10.1016/j.cedpsych.2019.101832
8. Glanz K, Rimer BK, Viswanath K. Health behavior: theory, research, and practice. 5th ed. San Francisco: Jossey-Bass; 2015.
9. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implement Sci. 2011;6:42. doi:10.1186/1748-5908-6-42
10. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implement Sci. 2012;7:37. doi:10.1186/1748-5908-7-37
11. West E, Barron DN, Reeves R. Overcoming the barriers to patient-centred care: time, tools and training. J Clin Nurs. 2005;14(4):435-443. doi:10.1111/j.1365-2702.2004.01083.x
12. Perdana M, Yen M. Factors associated with adherence to fluid restriction in patients undergoing hemodialysis in Indonesia. J Nurs Res. 2021;29(6):e182. doi:10.1097/jnr.0000000000000456
13. Guha C, Viecelli AK, Wong G, Manera K, Tong A. Qualitative research methods and its application in nephrology. Nephrology. 2021;26(10):755-762. doi:10.1111/nep.13921
14. Sousa H, Ribeiro O, Paul C, Costa E, Miranda V, Ribeiro F, et al. Social support and treatment adherence in patients with end-stage renal disease: a systematic review. Semin Dial. 2019;32(6):562-574. doi:10.1111/sdi.12833
15. Ishaq G, Kamran F, Rafique R, Sheerazi S. Impact of psycho-social factors on non-adherence: a case study of chronic kidney disease. J Liaquat Univ Med Health Sci. 2020;19(2):142-144. doi:10.22442/jlumhs.201920674
16. Agustiyowati THR, Sopia LW, Putri TARK. Hemodialysis patients: factors affecting adherence to treatment. J Keperawatan Komprehensif. 2023;9 Special Edition:112-121. doi:10.33755/jkk.v9iSpecialEdition.571
17. West R, Michie S. A brief introduction to the COM-B Model of behaviour and the PRIME Theory of motivation. Qeios. 2020. doi:10.32388/W0469A
18. Dyson J, Cowdell F. How is the Theoretical Domains Framework applied in designing interventions to support healthcare practitioner behaviour change? A systematic review. Int J Qual Health Care. 2021;33(3):mzab106. doi:10.1093/intqhc/mzab106
19. Keyworth C, Epton T, Goldthorpe J, Calam R, Armitage CJ. Are healthcare professionals delivering opportunistic behaviour change interventions? A multi-professional survey of engagement with public health policy. Implement Sci. 2018;13:78. doi:10.1186/s13012-018-0771-6
20. Michie S, Atkins L, West R. The behaviour change wheel: a guide to designing interventions. London: Silverback Publishing; 2014.
21. Al-agamy HM, Fouda LM, El Zeftway A, Mohammed NM. Effect of an educational intervention based on Family-Centered Empowerment Model on quality of life of hemodialysis patients and their caregivers. Tanta Sci Nurs J. 2022;26(3):98-118. doi:10.21608/tsnj.2022.259468
22. Hofstede G. Culture's consequences: comparing values, behaviors, institutions and organizations across nations. 2nd ed. Thousand Oaks: Sage Publications; 2001.
23. Nasif J, Din NC, Al-Khawaja M, Alawi AF, Al-Khatib N, Ayash A, et al. Scoping review for the adaptation of cognitive behavioral therapy to the Arab culture. Int J Cogn Ther. 2024;17(4):919-945. doi:10.1007/s41811-023-00188-x
24. Salam L. Adaptasi instrumen Patient Assessment of Chronic Illness Care untuk menilai kualitas perawatan diabetes melitus berdasarkan pengalaman pasien: versi Indonesia [master's thesis]. Makassar: Universitas Hasanuddin; 2023.
25. Polit DF, Beck CT. Essentials of nursing research: appraising evidence for nursing practice. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2020.
26. Polit DF, Beck CT. Nursing research: generating and assessing evidence for nursing practice. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2008.